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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/746,967	12/22/2000	Yuly M. Pulyer	49,919 (70972)	1159

7590 02/23/2004
EDWARDS & ANGELL
P.O. Box 9169
Boston, MA 02209

EXAMINER

FETZNER, TIFFANY A

ART UNIT	PAPER NUMBER
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2859

DATE MAILED: 02/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/746,967

Applicant(s)

PULYER, YULY M.

Examiner

Tiffany A Feltzner

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 22 December 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 December 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 02/2002 & 06/2002.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. **Figures 7, 8a, 8b, 8c, 9a, 9b, 10a, 10b, 11a, 11b** should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. Each of these Figures is found in US patent 6,002,255 issued December 14th 1999. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. **Claims 1, 2, 7, 8, and 13-19**, are rejected under **35 U.S.C. 102(b)** as being anticipated by **Pulyer** US patent 6,002,255 issued December 14th 1999. Applicant's filing date / priority date of 12/22/2000 is more than 1 year after the issued date of the **Pulyer** reference.

4. With respect to **Claim 1**, **Pulyer** teaches "A planar MRI system having an open magnet configuration that produces a magnetic field having a remote region of substantial magnetic field homogeneity, spatial encoding gradient coils and a RF coil" [See abstract] , **Pulyer** teaches, shows and suggests that "the open magnet configuration comprising: a ferromagnetic core having a substantially planar core

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surface layer and a longitudinal axis;" [See col. 9 lines 29-36; figures 6A, 6B, and 6C with ferromagnetic core component 61, col. 5 lines 25-35; col. 6 lines 29-38, and Figures 5a, 5b, with the longitudinal z-axis.] **Pulyer** also teaches, shows and suggests "a unipolar current wire pair" [See Figure 5b, col. 6 lines 24-29] "on a side of the ferromagnetic core adjacent said planar core surface layer, the wire pair being separated along said longitudinal axis and extending in a direction substantially perpendicular to the axis and substantially parallel to the planar core surface layer" [See Figures 5a, 5b, 6a, 6b, 6c, col. 6 lines 24-38; col. 9 lines 29-67], "the current wire pair providing a magnetic field having a maximum between the current wire pair along a direction perpendicular to said planar core surface layer and in said remote region of substantial magnetic field homogeneity" [See Figures 2a, 5a, 5b, 6a, 6b, 6c, abstract, col. 6 lines 24-38; col. 7 lines 28-59; col. 9 lines 29-67], "the planar core surface layer of the ferromagnetic core providing an orthogonal refractory effect that substantially increases the resulting magnetic field compared to a magnetic field generated by the current wire pair in free space." [See col. 9 lines 29-67; col. 7 lines 28-47] The examiner notes that **Pulyer** teaches using adjacent components, to the ferromagnetic core and ferromagnetic pole piece, oriented at right angles (i.e. orthogonal) to reduce current eddies across structural components. It is well known in the MRI / NMR art that as the amount of current eddies decrease, the homogeneity, or strength and uniformity, of the magnetic field produced by the ferromagnetic primary magnet core increases, because the presence of eddy currents causes a magnetic field to be inhomogeneous. **Pulyer** also teaches "increasing the resulting magnetic field compared to a magnetic field

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generated by the current wire pair in free space", by using "an orthogonal refractory effect", (i.e. right-angle layered plates) to increase the magnetic flux. [See col. 9 lines 29-67 and the entire reference in general. See also Figures 1a, 2c, 9a 10, 12b, 12d, and 13b. The Figures show/suggest the "refractory effect" by illustration, and the entire reference in general].

5. With respect to **Claim 2**, **Pulyer** teaches and suggests "the ferromagnetic core comprises a plurality of layers of ferromagnetic material including said planar core surface layer, which is adjacent said current wire pair, said magnet configuration being constructed and adapted such that the core surface layer operates near a magnetic saturation value of the ferromagnetic material forming the core surface layer." [See col. 9 lines 28-67, especially col. 9 lines 29-36; Figures 5a, 5b, 6a, 6b, 6c, col. 5 lines 24-34; where **Pulyer** teaches that the cross sectional area of the planar ferromagnetic core back plate can be made to have any predetermined value to keep the ferromagnetic material at the saturation point.] The same reasons for rejection that apply to **claim 1** also apply to **claim 2**.

6. With respect to **Claim 7**, **Pulyer** shows and suggests "a ferromagnetic end extension extending from the plane of planar core surface layer", (i.e. the layered plates of the adjacent ferromagnetic components which are oriented at right angles) the end extension being positioned adjacent to a wire of and longitudinally exterior of the current wire pair." [See Figures 6a, 6b, 6c, 5a, 5b, 1b, 2a, 3a; 11a; col. 6 lines 24-38, col. 9 lines 29-67] The same reasons for rejection, that apply to **claim 1**, also apply to **claim 7** and need not be reiterated.

7. With respect to **Claim 8**, **Pulyer** shows and teaches that "the ferromagnetic end extension" (i.e. the layered plates of the adjacent ferromagnetic components which are oriented at right angles to the core) "comprise a plurality of layers of ferromagnetic material including an end extension surface layer that is adjacent a wire of said current pair" [See col. 5 lines 14-43; col. 9 lines 29-67 Figures 6a, 6b, 6c, 5a, 5b, 1b, 2a, 3a; 11a], **Pulyer** suggests "said magnet configuration being constructed and adapted such that the end extension surface layer operates near a magnetic saturation value of the ferromagnetic material forming the end plate surface layer." [See col. 5 lines 14-43; col. 9 lines 29-67] The same reasons for rejection that apply to **claims 1, 7** also apply to **claim 8** and need not be reiterated.

8. With respect to **Claim 13**, **Pulyer** suggests and shows from the figures that "the ferromagnetic end plate extends perpendicular to the ferromagnetic core." [See col. 5 lines 29-35; col. 9 lines 29-36; Figures 6a, 6b, 6c] The same reasons for rejection that apply to **claims 1, 7** also apply to **claim 13** and need not be reiterated.

9. With respect to **Claim 14**, **Pulyer** suggests and shows from the figures that "the ferromagnetic end plate extends at an acute angle from the perpendicular to the planar core surface layer and in a direction toward the current wire pair. [See Figures 6a, 6b, 6c, 5a, 5b] The same reasons for rejection, that apply to **claims 1, 7** also apply to **claim 14** and need not be reiterated.

10. With respect to **Claim 15**, **Pulyer** suggests and shows from the figures that "angle is between 0 and about 20 degrees". [See Figure 6a, 6c] The same reasons for

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rejection, that apply to **claims 1, 7, 14** also apply to **claim 15** and need not be reiterated.

11. With respect to **Claim 16**, **Pulyer** shows and directly suggests from the figures that "a shimming current wire pair is located on a side of the ferromagnetic core closest to said planar core surface layer." [See col. 9 lines 29-67; Figures 7, 6a, 6b, 6c, 5a, 5b; col. 7 lines 38-47; col. 5 lines 14-47 and the entire reference in general] The same reasons for rejection that apply to **claim 1** also apply to **claim 16** and need not be reiterated.

12. With respect to **Claim 17**, **Pulyer** shows and directly suggests from the figures "a ferromagnetic shimming core having a planar shimming core surface layer adjacent to said shimming current wire pair." [See col. 7 lines 28-47; col. 9 lines 29-67; Figures 7, 6a, 6b, 6c, 5a, 5b; col. 5 lines 14-47, and the entire reference in general] The same reasons for rejection, that apply to **claims 1, 16** also apply to **claim 17** and need not be reiterated.

13. With respect to **Claim 18**, **Pulyer** shows from the figures "An MRI system having an open back to back magnet configuration that produces two independent magnetic fields, each having a remote region of substantial magnetic field homogeneity". [See Figures 7, 8, 9a, and 15; col. 9 line 37 through col. 13 line 15.] **Pulyer** teaches, and shows, "the system comprises spatial encoding gradient coils and a RF coil for each remote region, the open magnet configuration comprising: a ferromagnetic core having a longitudinal axis, a first and a second side, each side having substantially planar core surface layer; and a unipolar current wire pair on each side of the ferromagnetic core

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adjacent said planar core surface layer, the wire pair being separated along said longitudinal axis and extending in a direction substantially perpendicular to the axis and substantially parallel to the planar core surface layer, wherein said unipolar current wire pair on each side of the ferromagnetic core are provided by a pair of current loops wound around the ferromagnetic core; each current wire pair providing a magnetic field having a maximum between the current wire pair along a direction perpendicular to said planar core surface layer and in said remote region of substantial magnetic field homogeneity, the planar core surface layer of the ferromagnetic core adjacent each current wire pair providing an orthogonal refractory effect that substantially increases the resulting magnetic field compared to a magnetic field generated by the current wire pair in free space" for the same lack of novelty reasons that were provided with respect to **claim 1**, which need not be reiterated. The same reasons for rejection that apply to **claim 1**, also apply to **claim 18** and need not be reiterated.

14. With respect to **Claim 19**, **Pulyer** shows and directly suggests from the figures "A MRI system having two face to face open magnet configurations that each produce a magnetic field having a remote region of substantial magnetic field homogeneity,". [See Figures 7, 8, 9a, and 15; col. 9 line 37 through col. 13 line 15, abstract.] **Pulyer** teaches, and shows the limitations of, "spatial encoding gradient coils and a RF coil, wherein a first and a second open magnet configuration each comprise: a ferromagnetic core having a substantially planar core surface layer and a longitudinal axis; and a unipolar current wire pair on a side of the ferromagnetic core adjacent said planar core surface layer, the wire pair being separated along said longitudinal axis and extending in a

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direction substantially perpendicular to the axis and substantially parallel to the planar core surface layer, the current wire pair providing a magnetic field having a maximum between the current wire pair along a direction perpendicular to said planar core surface layer and in said remote region of substantial magnetic field homogeneity, the planar core surface layer of the ferromagnetic core providing an orthogonal refractory effect that substantially increases the resulting magnetic field compared to a magnetic field generated by the current wire pair in free space", for the same rejection reasons that were provided with respect to **claim 1**, which need not be reiterated.

15. **Pulyer** teaches, shows and directly suggests from the figures, that "the remote region of substantial magnetic field homogeneity provided by a first open magnet configuration overlaps the remote region of substantial magnetic field homogeneity provided by a second open magnet configuration," [See Figure 13b, 14b, 2b, 2c, 3b, 5b, 9a, 10] "thereby providing a total magnetic field equal to the sum of the remote regions provided by the first and the second open magnet configurations." [See col. 3 line 15 through col. 5 line 47; col. 10 line 45 through col. 13 line 15] The same reasons for rejection, that apply to **claim 1**, also apply to **claim 19** and need not be reiterated.

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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17. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

18. **Claims 3-5, 9-11** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Pulyer** US patent 6,002,255 issued December 14th 1999.

19. With respect to **Claims 3, 4, and 5**, which depend from **claim 2**, **Claims 9, 10, and 11**, which depend from **claim 8**, **Pulyer** lacks directly teaching that "the core surface layer comprises a ferromagnetic material having a magnetic property including a Hsat value and the core surface layer operates within about" 20% (i.e. claims 3, 9), 10% (i.e. claims 4, 10), 5% (i.e. claims 5, 11), "of the Hsat value". However, because **Pulyer** teaches that the cross sectional area of the planar ferromagnetic core backplate can be made to have any predetermined value to keep the ferromagnetic material at saturation point", It would have been obvious to one of ordinary skill in the art, at the time that the invention was made that the planar ferromagnetic core surface layer of the **Pulyer** reference has a saturation or Hsat value and that the area of the core surface layer is controlled based upon that saturation value, therefore, the **Pulyer** reference functions based upon maintaining the cross0sectional area of the planar core as close to saturation as possible, and since the predetermined value can be "any value" it would have been obvious to one of ordinary skill in the art, at the time that the invention was

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made that the surface layer functions "within about 20% (i.e. claims 3, 9), 10% (i.e. claims 4, 10), or 5% (i.e. claims 5, 11), of the Hsat value". [See col. 5 lines 24-34; col. 9 lines 29-67 Figures 5a, 5b, 6a, 6b, 6c] The same reasons for rejection that apply to **claims 1, 2, 7, 8** also apply to **claims 3, 4, 5, 9, 10, and 11** and need not be reiterated.

20. **Claims 6, 12** are rejected under **35 U.S.C. 103(a)** as being unpatentable over **Pulyer** US patent 6,002,255 issued December 14th 1999, in view of **Mallard et al.**, US patent 4,656,449 issued April 7th 1987.

21. With respect to **Claim 6**, and corresponding **claim 12**, **Pulyer** teaches that "the core/extension surface layer comprises a first ferromagnetic material" [See ferromagnetic core 61 col. 9 lines 29-36] **Pulyer** also teaches that "at least one of the layers comprises a second ferromagnetic material" [See col. 9 lines 29-36; ferromagnetic pole piece 63], **Pulyer** lacks directly teaching that "the first ferromagnetic material has a higher saturation induction and permeability than the second ferromagnetic material", because **Pulyer** lacks directly teaching if the ferromagnetic material that makes up core 61, and pole piece 63 is the same material or a different material, but the examiner notes that in the **Pulyer** reference there are at least two distinct ferromagnetic components. However, **Mallard et al.**, also teaches a magnetic resonance device with a core of stacked (i.e. layered) ferromagnetic material in an open "C" type magnet configuration, [See abstract, col. 1 lines 29 through col. 2 line 16] that may be planar or gradually varying in curvature, or have a stepped shape. [See col. 4 lines 7-21] **Mallard et al.**, also teaches that "the core surface layer comprises a first ferromagnetic material" (i.e. silicon iron sheets component 6 in **Mallard et al.**, Figures 4

and 6) [See col. 3 lines 27 through col. 4 line 2] and "at least one of the layers comprises a second ferromagnetic material" (i.e. ferromagnetic shim strips of electrical sheet steel component 5 in **Mallard et al.**, Figures 4, 5, 6 and 7) [See col. 3 lines 27 through col. 4 line 2] "wherein the first ferromagnetic material has a higher saturation induction and permeability than the second ferromagnetic material", [See **Mallard et al.**, col. 4 lines 22-33; col. 3 lines 16-40]

22. It would have been obvious to one of ordinary skill in the art, at the time that the invention was made that the **Mallard et al.**, reference can be combined with the **Pulyer** reference because the **Pulyer** reference, is an MR apparatus that expands on the invention of **Mallard et al.** Both references teach using a ferromagnetic core, with ferromagnetic layers, and teach the importance of the surface area of the layers to maintaining the core at saturation, however the **Mallard et al.**, reference is drawn more toward the structure of the core, while the **Pulyer** reference expands on **Mallard et al.**'s teachings and is drawn more toward the entire magnetic resonance imaging system as a whole. The examiner considers the teachings of **Mallard et al.**, to be implicit to the **Pulyer** reference, since the **Pulyer** reference essentially builds off of the earlier work of **Mallard et al.**, The same reasons for rejection that apply to **claims 1, 2, 7** also apply to **claims 6, 12** and need not be reiterated.

23. The **prior art made of record** and not relied upon is considered pertinent to applicant's disclosure.

A) **Pulyer** US patent 5,389,879 issued February 1995.

B) **Crow** US patent 5,642,087 issued June 24th 1997.

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C) **Damadian** US patent 6,023,255 issued February 2000.

Conclusion

24. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

25. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached on (703) 308-3875: **until February 10th 2003**. After **February 10th 2003** (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.


26. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-0956.



TAF

February 2, 2004

Diego Gutierrez
Supervisory Patent Examiner
Technology Center 2800



EDWARD LEFKOWITZ
SUPERVISORY PATENT EXAMINER
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